Introduction to Liquefied Natural Gas Regulations

49 CFR Part 193
US Department of Transportation
Pipeline & Hazardous Materials Safety Administration

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Inspector Training & Qualifications Division

Background

- Regulation of LNG Facilities from 1938 to 1980
  - Natural Gas Act of 1938
    - Federal Power Commission (FPC) receives authority to regulate natural gas sale, transportation, and use in interstate or foreign commerce.

Background (continued)

- Regulation of LNG Facilities from 1938 to 1980 (continued)
  - Natural Gas Pipeline Safety Act of 1968
    - Department of Transportation (DOT) receives authority to regulate natural gas pipeline safety; FPC retains authority to impose additional safety requirements and to determine location of interstate natural gas pipelines.
    - October 1972 DOT incorporates 1971 NFPA 59A as interim federal safety standards for LNG facilities.
    - 1977 to 1979 DOT proceeds with rulemaking to establish permanent federal safety standards for LNG facilities.

Background (continued)

- Regulation of LNG Facilities from 1938 to 1980 (continued)
  - Pipeline Safety Act of 1979
    - DOT is required to establish siting requirements for LNG facilities after considering certain factors (e.g., facility use, population, land use, natural physical aspects, available emergency response, and remote siting).
    - DOT is required to establish safety standards for design, construction, testing, operation, and maintenance of LNG facilities.
    - FERC retains authority to determine the location and routing of LNG facilities.

Background (continued)

- Regulation of LNG Facilities from 1980 to 2000
  - 1980 Federal Safety Standards for LNG Facilities (49 CFR Part 193)
    - DOT complies with the mandates in the 1979 Act.
    - NFPA 59A is incorporated into 49 CFR Part 193 by reference, with regulatory preemption in the event of conflict.
    - LNG terminals have been built or approved in Everett, MA; Cove Point, MD; Elba Island, GA; Lake Charles, LA; and Kenai, AK.

Background (continued)

- Regulation of LNG Facilities from 2000 to Present
  - FERC licenses LNG import terminals that are located onshore or in state waters.
  - MARAD licenses LNG import terminals on the outer continental shelf.
  - USCG regulates all offshore LNG facilities, except for siting of marine cargo transfer systems.
  - PHMSA regulates all onshore and issues siting standards for waterfront LNG facilities, including marine cargo transfer systems.

LNG Facility

- Means:
  - a pipeline facility that is used for liquefying natural gas or synthetic gas *(liquefaction units)* or
  - transferring, storing, *(piping, pumps, transfer systems)* or
  - vaporizing liquefied natural gas *(vaporizers)*

(descriptive text added)

Pipeline Facility

- Means:
  - new and existing *piping*,
  - rights-of-way, and
  - any *equipment, facility, or building* used in the transportation of gas or
  - in the treatment of gas during the course of transportation

emphasis added

LNG Plant

- Means:
  - an LNG facility or
  - system of LNG facilities functioning as a unit

So .. When we say "LNG Plant" in the traditional Industry sense we are not too far off from the regulatory definition … but … not the case with "LNG Facility" which could be a piece of equipment some piping, some section or part of a plant (facilities), etc.

§ 193.2001 Scope of part

(a) This part prescribes safety standards for LNG facilities used in the transportation of gas by pipeline that is subject to:

- the pipeline safety laws (49 U.S.C. 60101 *et seq.*) and
- Part 192 of this chapter

§ 193.2001 Scope of part (cont.)

(b) This part does **not** apply to:

(1) LNG facilities used by ultimate consumers of LNG or natural gas.

This can be invoked when a company is liquefying gas for fuel for their own fleet or facility or for feedstock for one of their own processes (or perhaps as a result of one of their processes). Regardless, the consumer is the liquefier and nothing changes hands between feedstock (gas) purchase and consumption.

§ 193.2001 Scope of part (cont.)

(b) This part does **not** apply to: (cont.)

(2) LNG facilities used in the course of natural gas treatment or hydrocarbon extraction which do not store LNG.

In this case, LNG is produced when treating natural gas, or removing other hydrocarbons. LNG is typically not the focus of these facilities, it is part of the process. Note that this can be applied as long as there is no storage.

§ 193.2001 Scope of part (cont.)

(b) This part does **not** apply to: (cont.)

(3) In the case of a marine cargo transfer system and associated facilities, any matter *other than siting* pertaining to the system or facilities between the marine vessel and the last manifold (or in the absence of a manifold, the last valve) located immediately before a storage tank

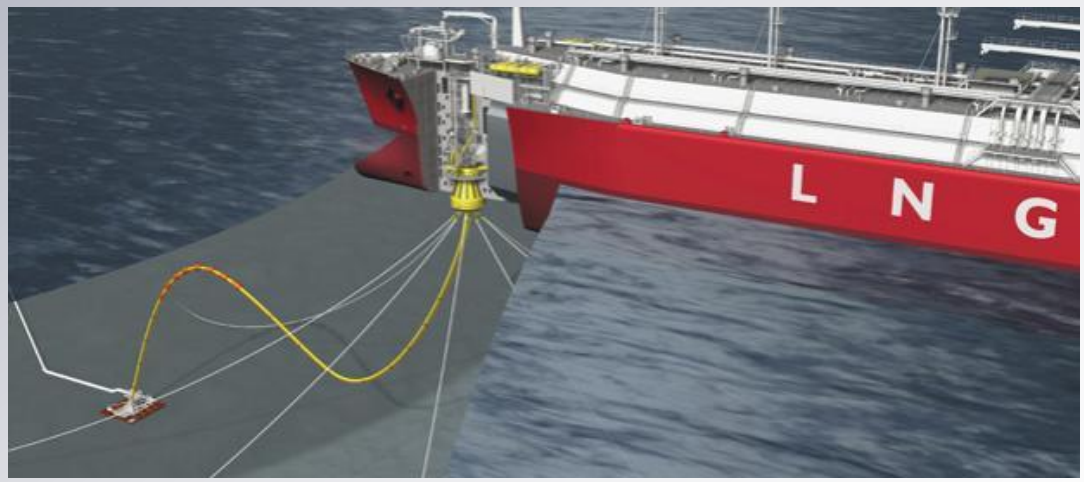
As reinforced in several recent interpretations, the "marine cargo transfer system" refers to the part of the waterfront plant that transfers LNG from a marine vessel to a storage tank in an import terminal or from the storage tank to the marine vessel in an export terminal.

§ 193.2001 Scope of part (cont.)

(b) This part does **not** apply to: (cont.)

(4) Any LNG facility located in navigable waters

This describes a facility or collection of facilities completely in navigable waters. Typically only a natural gas pipeline comes to shore if anything at all.

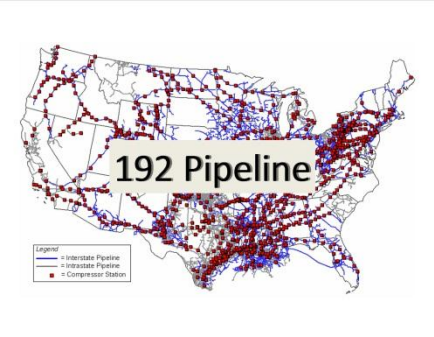


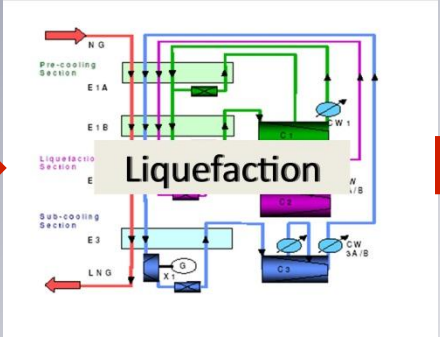
Incorporation By Reference

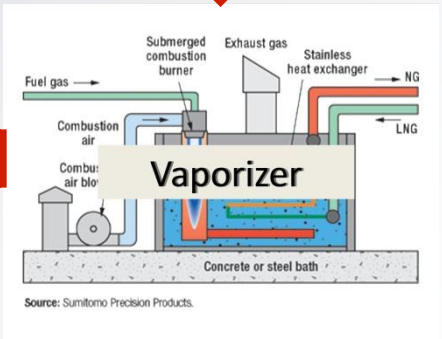
Just a brief Reminder …

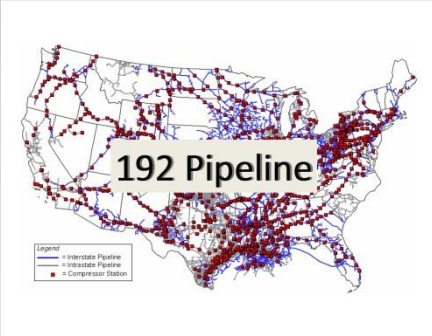
- There are many parts of 49 CFR Part 193 which require compliance with NFPA 59A "Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG)"
- Most are referring to the 2001 edition of NFPA 59A
- In Design, regarding seismic considerations, and in nondestructive testing, regarding ultrasonic examinations, the reference is to the 2006 edition of NFPA 59A
- There is no incorporation of the 2009 edition of NFPA 59A

LNG Plant Examples
Regulated by PHMSA / State Partner?



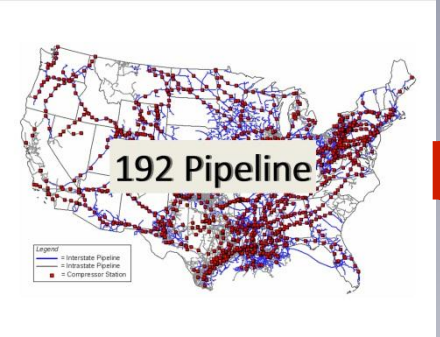


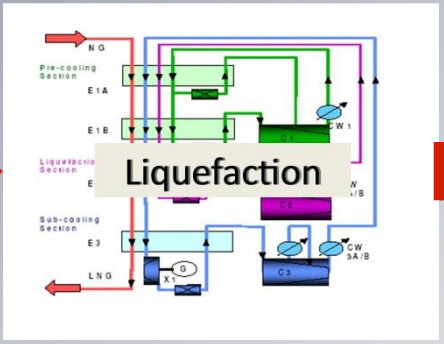


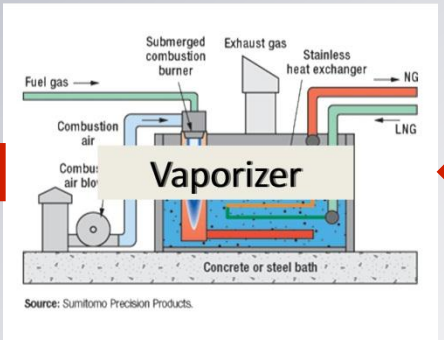


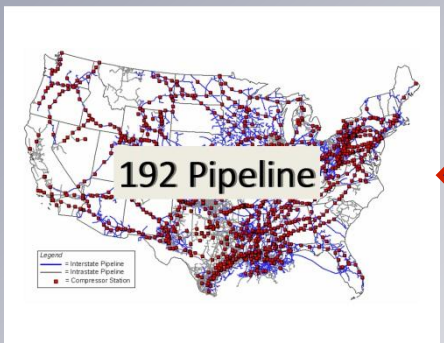
Looks like a peakshaving facility. Regulated by PHMSA or a State Partner.

LNG Plant Examples
Regulated by PHMSA / State Partner?





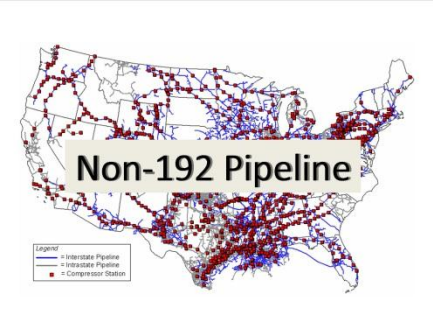


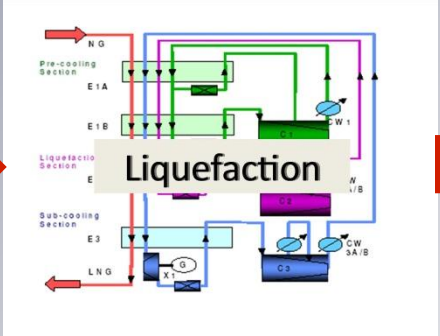


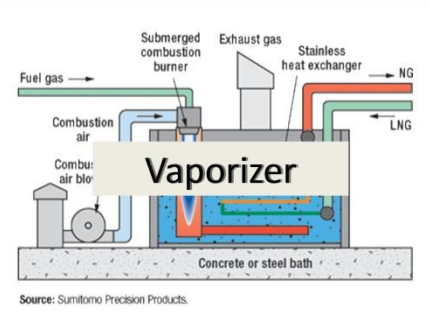
Vaporizing into a 192 facility so the LNG supplying it is a 193 facility. Regulated by PHMSA or a State Partner.

LNG Plant Examples (cont.)

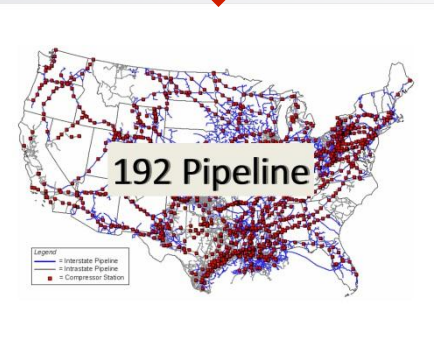
Regulated by PHMSA / State Partner?





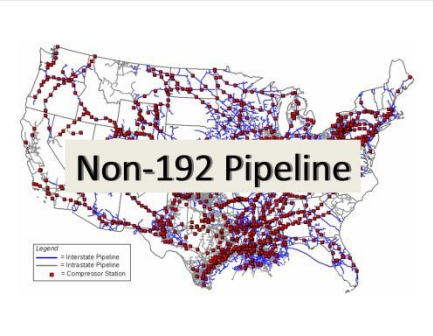


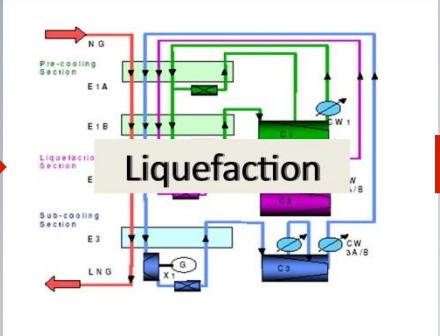
In this example the non-192 gas is raw. This facility would be exempted due to lack of storage therefore would not be regulated by PHMSA or a State Partner.

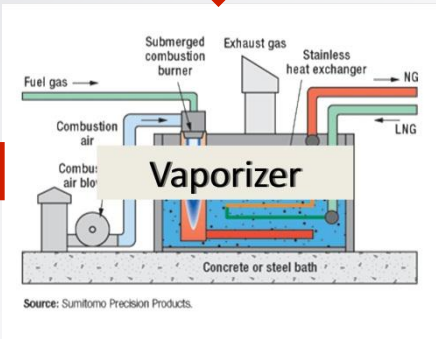


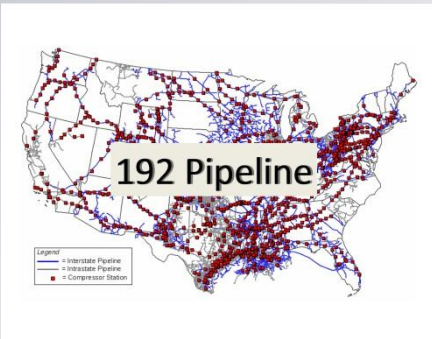
LNG Plant Examples (cont.)

Regulated by PHMSA / State Partner?





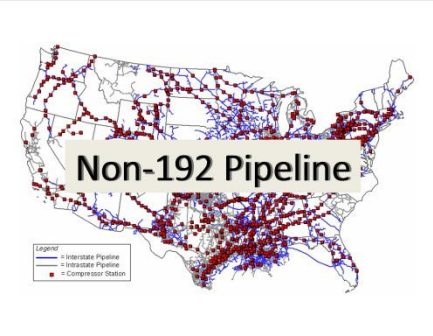


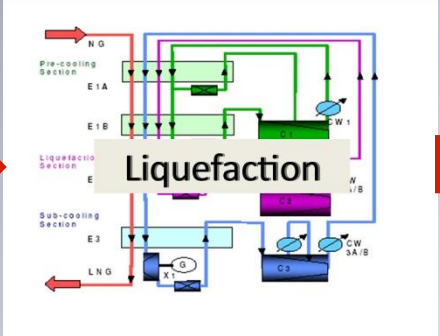


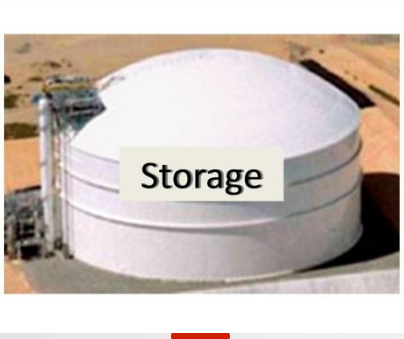
This is the same as the previous example with storage added and it would be regulated by PHMSA or a State Partner.

LNG Plant Examples (cont.)

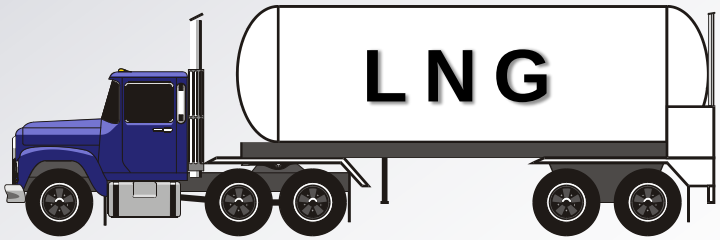
Regulated by PHMSA / State Partner?





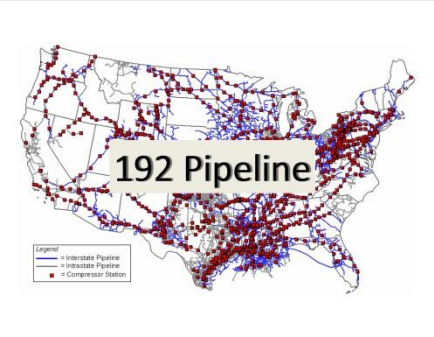


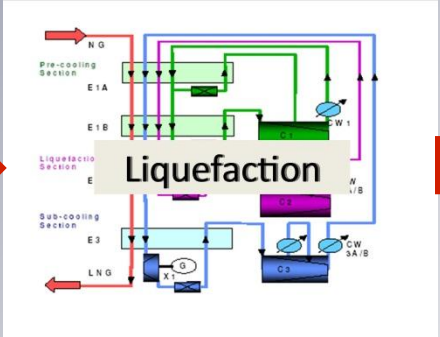
No storage and connected to non-192 pipeline is non-jurisdictional. Trucks are not a pipeline, so even with storage, non-jurisdictional (exempted).

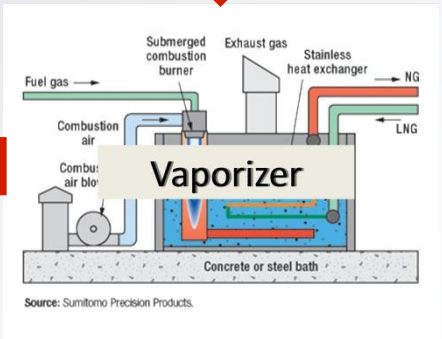


LNG Plant Examples (cont.)

Regulated by PHMSA / State Partner?



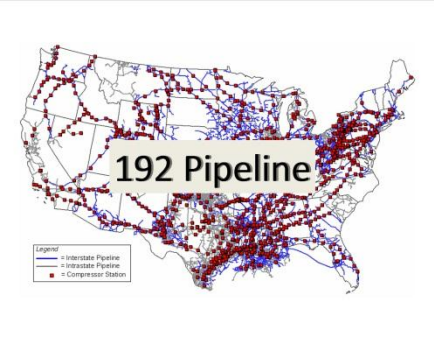


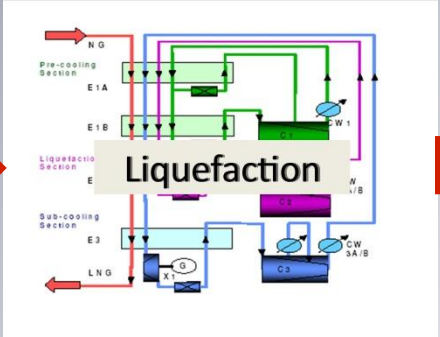


The CNG fueling station is not jurisdictional to PHMSA, but the LNG plant might be, depending on who owns it and who can fuel their vehicles at the CNG station.

LNG Plant Examples (cont.)

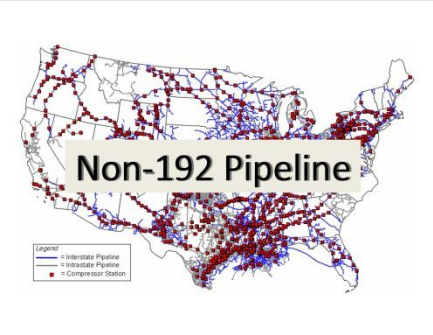
Regulated by PHMSA / State Partner?

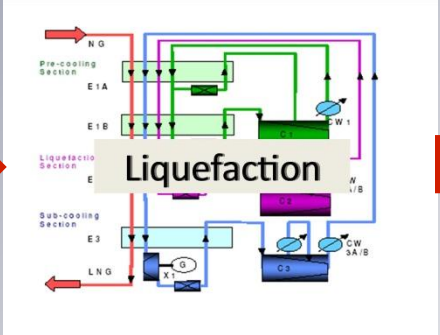




The LNG fueling station is not jurisdictional to PHMSA, but the LNG plant might be, depending on who owns it and who can fuel their vehicles at the LNG station.

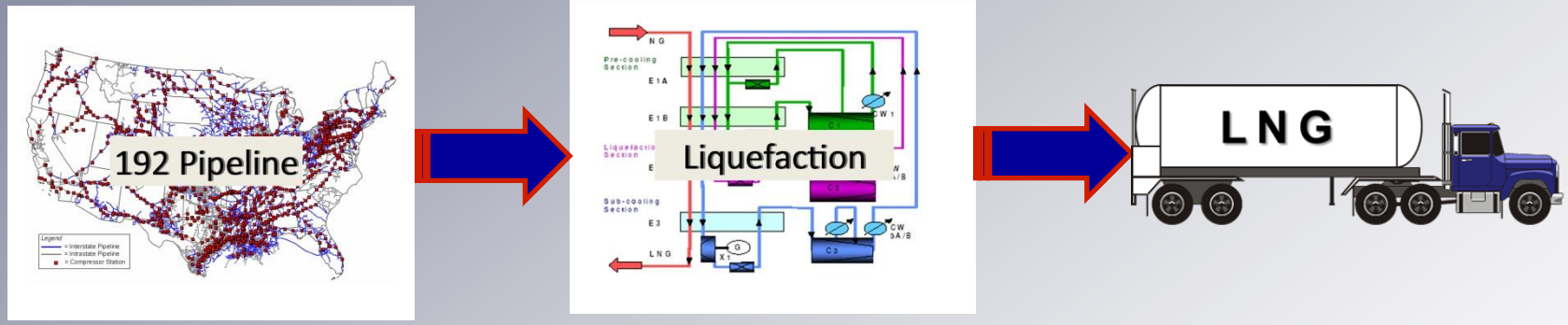
LNG Plant Examples (cont.)
Regulated by PHMSA / State Partner?





No 192 pipeline involved, thus no jurisdiction to PHMSA or State Partners (exempted).

LNG Plant Examples (cont.)
Regulated by PHMSA / State Partner?



Maybe Jurisdictional to PHMSA or State Partners, maybe not, depending on end user of LNG (truck destination). Does the truck deliver to a 192 system? A fuel storage system for a power plant which owns the liquefaction unit and the trucking company?

Siting Requirements

- Include a number of safety checks including
  - *vapor dispersion exclusion zone analysis* and
  - *thermal radiation exclusion zone analysis* as well as an
  - *analysis of other hazards* which my be present at the facility
- Apply to *new facilities* and may apply to *changes in existing facilities*

Siting Requirements (cont.)

- If changes to an existing facility constitute a *"significant alteration"*, siting requirements apply
- According to Subpart B - Siting Requirements §193.2051 Scope:

  Each LNG facility designed, constructed, replaced, relocated or significantly altered after March 31, 2000 must be provided with siting requirements in accordance with the requirements of this part and of NFPA 59A. In the event of a conflict between this part and NFPA 59A, this part prevails.

- "NFPA 59A" means "Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG)" from the National Fire Protection Association – Editions 2001 and 2006 as incorporated by Part 193

Letter of Interpretation

July 31, 2009 Letter of Interpretation

Sumbitter: Jeff Wright, Director, Office of Energy Projects, Federal Energy Regulatory Commission

Question Presented: Do the Siting Requirements in Subpart B of 49 C.F.R. Part 193 apply to the Mount Hope Bay LNG Transfer System?

Answer: Yes. The Mount Hope Bay LNG Transfer System is a marine cargo transfer system subject to the Siting Requirements in Subpart B of 49 C.F.R. Part 193.

Question Presented: How should the Siting Requirements in Subpart B of 49 C.F.R. Part 193 be applied to the Mount Hope Bay Transfer System?

Answer: The exclusion zone for the PIP LNG Transfer System, one of the two main components in the MHB LNG Transfer System, cannot be calculated using the approved thermal-radiation and vapor-gas-dispersion models. Accordingly, Weaver's Cove must develop, and submit to the PHMSA Administrator for approval, an alternative model for calculating those distances.


Federal Turning Basin
New Brightman St. Bridge
(under construction)
Old Brightman St. Bridge
FERC Approved Terminal Site
Proposed LNG Transfer System Route
Braga Bridge
Brayton Point Channel
SWANSEA
SOMERSET
Offshore Berth
SOMERSET
FALL RIVER
0
2,000
4,000
Feet

Letter of Interpretation

March 25, 2010 Letter of Interpretation

Submitter: The City of Fall River, Massachusetts

Question Presented: Do the Pipeline Safety Laws provide PHMSA with the authority to regulate the MHB Transfer System?

Answer: Yes. The statutory exclusion for structures or equipment located in navigable waters does not preclude PHMSA from regulating the MHB LNG Transfer System. 49 U.S.C. §60101(a)(14). Congress enacted that provision to prohibit a delegation of PHMSA's preemptive rulemaking authority to the U.S. Coast Guard, not to impose a water's-edge limitation on PHMSA's jurisdiction. The Siting Requirements in Subpart B apply to marine cargo transfer systems at waterfront LNG plants, but 49 C.F.R. Part 193 does not apply in any other respect to offshore LNG facilities. *Compare* 49 C.F.R. § 193.2001(b)(3) *with* 49 C.F.R. § 193.2001(b)(4).

Question Presented: Is the MHB LNG Transfer System a marine cargo transfer system for purposes of the Siting Requirements in 49 C.F.R. Part 193?

Answer: Yes. The MHB LNG Transfer System is a marine cargo transfer system—i.e., a component, or system of components, that functions as a unit for the sole purpose of transferring LNG in bulk between a marine vessel and a storage tank.

Letter of Interp. (continued - City of Fall River - March 25, 2010)

Question Presented: Do the Siting Requirements in Subpart B of 49 C.F.R. Part 193 require an exclusion-zone analysis of the PIP LNG Transfer System?

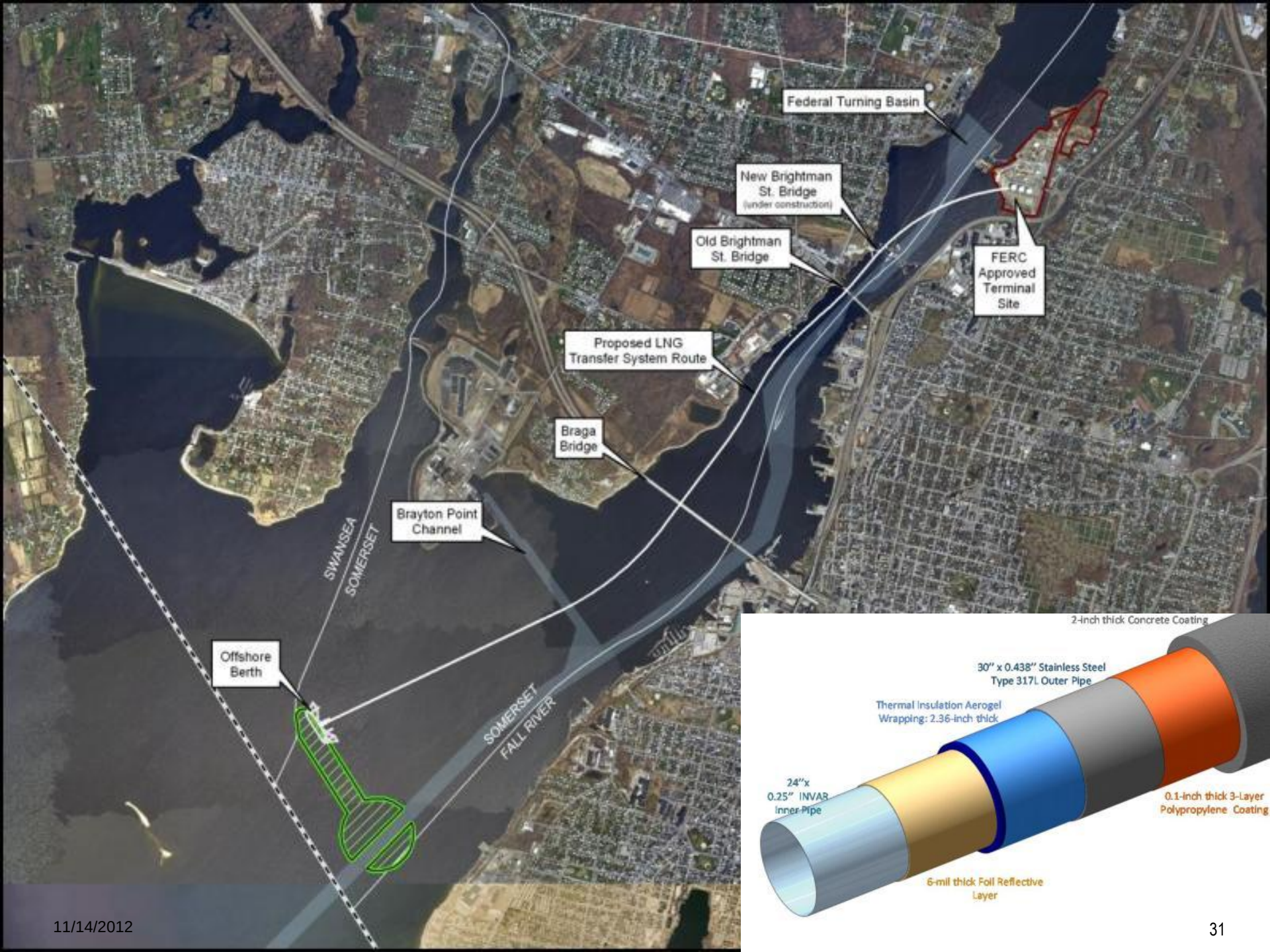
Answer: Yes. An "LNG transfer system" must have an exclusion zone under 49 C.F.R. §§ 193.2057, 193.2059. Any contrary provision in the 2001 NFPA 59A applicable to "transfer areas for LNG" is preempted by those regulations in the event of conflict.

Question Presented: Do the Siting Requirements in 49 C.F.R. Part 193 apply to the onshore portion of the MHB Transfer System?

Answer: Yes.

Question Presented: What design spill should be used in determining the exclusion zone for the MHB Transfer System?

Answer: Weaver's Cove must develop, and submit to the Administrator for approval, an alternative model for calculating the exclusion zone for the MHB Transfer System. PHMSA is developing additional guidance on the design spill that should be used for that purpose.


Federal Turning Basin
New Brightman St. Bridge (under construction)
Old Brightman St. Bridge
FERC Approved Terminal Site
Proposed LNG Transfer System Route
Braga Bridge
Brayton Point Channel
SWANSEA
SOMERSET
Offshore Berth
SOMERSET
FALL RIVER
2-inch thick Concrete Coating
30" x 0.438" Stainless Steel Type 317L Outer Pipe
Thermal Insulation Aerogel Wrapping: 2.36-inch thick
24"x 0.25" INVAR Inner Pipe
0.1-inch thick 3-Layer Polypropylene Coating
6-mil thick Foil Reflective Layer

Letter of Interpretation

July 7, 2010 Letter of Interpretation

Submitter: John Keppel and Michael Miozza, Residents, City of Fall River, Massachusetts

Question Presented: Can SOURCE5 be used with DEGADIS to determine the vapor-gas-dispersion exclusion zone for an LNG facility?

Answer. No. SOURCE5 may not accurately represent the likely effects of pool spreading and resulting flammable vapor flashing or vapor accumulation within impoundments. Therefore, that source term model can no longer be used as the input for DEGADIS to determine the vapor-gas-dispersion exclusion zone for an LNG facility.

193 Vapor Dispersion Modeling

- There have been some significant technical studies on source term and vapor gas dispersion modeling in the past 5-10 years
- At the request of NFPA Fire Protection Research Foundation (FPRF), the Health & Safety Executive's Health & Safety Laboratory prepared a pair of reports on these subjects
- Concluded that SOURCE5 suffers from two deficiencies:

193 Vapor Dispersion Modeling

- SOURCE5 deficiencies are that it does not accurately represent the likely effects of

  (1) pool spreading and the resulting flammable vapor flashing or

  (2) vapor accumulation within impoundments

- According to the FPRF report, those deficiencies could lead to an under-prediction of the distance of a vapor gas exclusion zone for an LNG plant.

Source Term Model (or Submodel)

- The source term model used as the input for DEGADIS must have a suitable basis to comply with our vapor-gas exclusion zone requirements
- To comply with our vapor gas exclusion zone requirements, the vaporization rates specified as the input for DEGADIS must have a suitable scientific basis
- PHMSA concluded that SOURCE5 can no longer be used to determine the vapor gas exclusion zone for an LNG plant, without taking appropriate actions to address the deficiencies identified in the FRPF reports
- Conservatism is important and expected

Letter of Interpretation

July 16, 2010 Letter of Interpretation

Submitter: Downeast LNG, Inc.

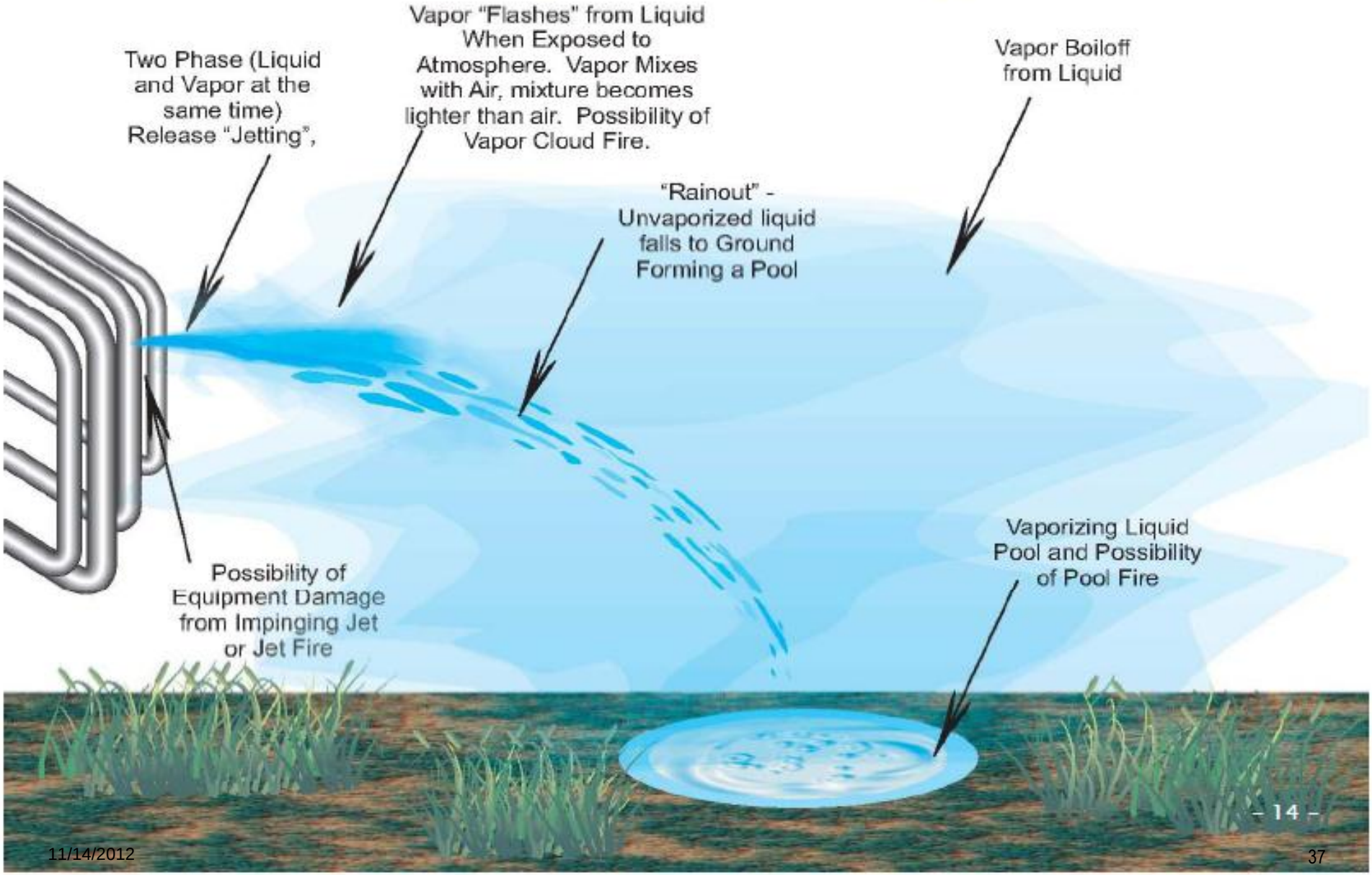
Question Presented: Can a new source term model developed by Downeast LNG be used with DEGADIS to determine the vapor-gas-dispersion exclusion zone for the sumps at its Robbinston, Maine LNG Terminal?

Answer: Yes. The Downeast LNG source term model makes conservative assumptions for the likely effects of pool spreading, vapor production, and vapor retention and is suitable for use in calculating the vapor-gas-dispersion exclusion zone for the sumps at its Robbinston, Maine LNG Terminal.

Question Presented: Should the effects of jetting and flashing be considered in performing an exclusion analysis?

Answer: Yes. A source term model should account for the effects of jetting and flashing in appropriate cases, including where the design-spill scenario involves a failure of pressurized piping or equipment. A failure to consider the effects of jetting and flashing (or any other phenomena that has a similar influence on the discharge, vaporization, or conveyance of LNG) in such cases could distort the downwind dispersion of vapor gas and compromise the integrity of an exclusion zone analysis.

Jetting and Flashing

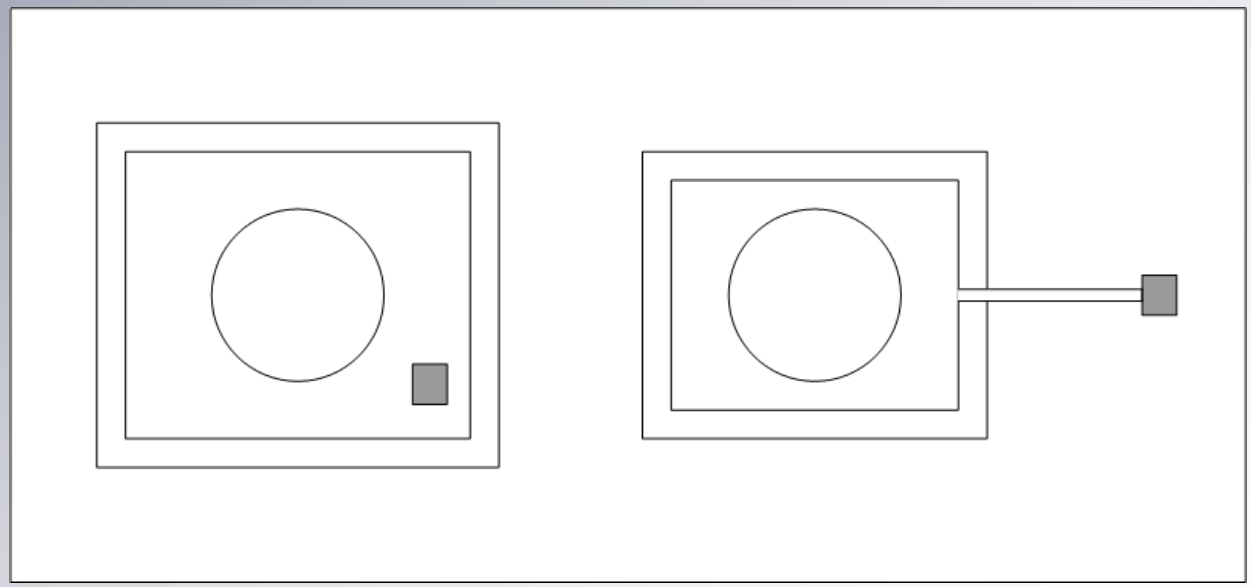


Jetting / Flashing / Conveyance

- In the case of jetting and flashing, there is no dispute that a failure of pressurized piping or equipment may cause LNG to vaporize in the air
- Using a source term model that ignores that effect (or any other phenomena that has a similar influence on the discharge, vaporization, or conveyance of LNG) could distort the downwind dispersion of vapor gas and compromise the integrity of an operator's exclusion zone analysis
- A source term model should account for the effects of jetting and flashing in appropriate cases, including where a design-spill scenario involves a failure of pressurized piping or equipment

LNG Storage Site Configurations

- There are many configurations and each site is somewhat unique
- There are also many tank configurations … many of the current tank configurations can be grouped as either Single or Double Containment, Full Containment, or ASME Tanks for Regulatory Purposes



Other Phenomena

- Using a source term model that ignores [jetting and flashing] effect[s] (or any other phenomena that has a similar influence on the discharge, vaporization, or conveyance of LNG) could distort the downwind dispersion of vapor gas and compromise the integrity of an operator's exclusion zone analysis
- Dispersion analysis from some areas of a facility might also be different than that of a traditional impoundment

Letter of Interpretation

December 22, 2010 Interpretation

Submitter: Freeport LNG Development, L.P.

Question: Can a new source term model developed by Freeport LNG (FLNG) be used with DEGADIS to determine the vapor-gas-dispersion exclusion zone for the proposed natural gas liquids (NGL) extraction system at its Quintana Island, Texas LNG Terminal?

Answer: Yes. The FLNG Source Term Model uses generally-accepted assumptions for heat transfer and conservative assumptions for pool spreading and vapor retention. Accordingly, FLNG can use that source term model as the input for DEGADIS to determine the VGD exclusion zone for its NGL extraction system. However, FLNG must still account for other phenomena that could influence the discharge, vaporization, or conveyance of LNG to the sump in performing its exclusion zone analysis, including the effects of jetting and flashing for any design-spill scenarios that involve the failure of pressurized piping or equipment.

Letter of Interpretation

April 18, 2011 Interpretation

Submitter: Randall Rich, Counsel for Maine Liquid Methane Fuels, LLC (MLMF)

Question: Would MLMF's proposed liquefaction and trucking facility in Brewer, Maine, be subject to the minimum federal safety standards for liquefied natural gas (LNG) facilities in 49 C.F.R. Part 193?

Answer: Yes. MLMF's LNG facilities would be used in the transportation of gas by pipeline and do not qualify for any of the exemptions provided in 49 C.F.R. § 193.2001(b), including for facilities used by ultimate consumers or in the course of natural gas treatment or hydrocarbon extraction

Letter of Interpretation

December 22, 2011 Interpretation

Submitter: William Cope, Vice President, Operations, Southern LNG Company, LLC (SLNG)

Question: Would certain modifications to the Elba Island LNG Import Terminal's truck loading facilities qualify as a replacement, relocation, or significant alteration of an existing LNG facility and require compliance with the current siting requirements in 49 C.F.R. Part 193?

Answer: SLNG filed its application for approval of the two existing truck loading stations at the Elba Island LNG Import Terminal before March 1, 1978, and construction began before November 29, 1979. The LNG facilities in those two stations are "existing liquefied natural gas facilities" under 49 U.S.C. § 60101(a)(1), and the current siting requirements in 49 CFR Part 193 cannot be applied to those facilities (or any replacement components) under 49 U.S.C. § 60103(c).

However, if these existing LNG facilities are replaced, relocated, or significantly altered, they become new LNG facilities under 49 U.S.C. § 60101(a)(16) and compliance with the siting requirements is required under 49 CFR §§ 193.2005(b) and 193.2051. Any reconstruction activity that exceeds in-kind replacement or increases the capacity of an existing facility meets that standard. Based on the information presented, the current siting requirements in 49 C.F.R. Part 193 would apply to all of the proposed modifications in the first phase of SLNG's trucking project, except for the 2000-foot, 6-inch LNG header pipeline and the 2000-foot, 3-inch LNG vapor return header.

Petitions for Finding or Approval

Petitioner: Brian D. O'Neill, Counsel, UGI LNG, Inc.

Request: To obtain approval of a gravity drainage system for the impoundment area at its liquefied natural gas plant in Berks County, Pennsylvania.

Response: The petition is denied. Section 193.2173(a) states that "[i]mpoundment areas must be constructed such that all areas drain completely to prevent water collection," and that "[d]rainage pumps and piping must be provided to remove water from collecting in the impoundment area." It further states that "[a]lternative means of draining may be acceptable subject to the Administrator's approval." UGI's proposed gravity drainage system could possibly meet the objectives of the regulation, i.e., maximizing the amount of space that is available for LNG containment and reducing the likelihood of increased vapor generation if LNG is released. However, its use of such a system could compromise public safety in other respects, i.e., the proposed penetration in the sump wall creates a single point of failure and a pathway for LNG to flow directly into the retention pond. The measures that UGI has proposed to address those concerns would introduce additional operational complexity without providing more effective water removal or containment. UGI also failed to file its petition in a timely fashion.

August 2010 Advisory Bulletin

- 49 CFR Part 193: Flammable vapor-gas dispersion distances must be determined in accordance with … DEGADIS … [or] may be calculated in accordance with … FEM3A for LNG Accident Consequence Analyses". ***The use of alternate models … shall be permitted, subject to the Administrator's approval***
- The current models named in the regulation can not adequately model all configurations. A procedure was needed to work towards model approval
- We chose to use an Advisory Bulletin to accomplish this task. The Advisory Bulletin directs users to the Model Evaluation Protocol (MEP) developed by the Fire Protection Research Foundation along with some added steps to satisfy PHMSA, FERC, and NASFM needs.
- The basic principle behind the MEP and the Advisory Bulletin is the comparison of model output and measurements from a number of past experiments

Administrator's October 7, 2011 Decision

Petitioner: Det Norske Veritas (USA), Inc.

Request: For approval of the PHAST-UDM (Process Hazard Analysis Software Tool – Unified Dispersion Model) under 49 C.F.R. §§ 190.9 and 193.2059(a).

Response: Approved. UDM may be used to model the maximum arc-wise concentration for: (1) Dispersion from circularly shaped LNG pools; (2) Dispersion from LNG pools in impoundments with low-aspect ratios (ratio of the surface dimensions of the impoundment); or (3) Dispersion from releases in any direction (horizontal, vertical, or otherwise), including releases from flashing, venting, vent stacks, and pressure relief discharge. However, UDM may not be appropriate to model the maximum arc-wise concentration for: (1) Dispersion from irregularly shaped LNG pools; (2) Dispersion from LNG pools with high-aspect ratios, including some impoundments and nearly all trenches; or (3) Dispersion from multiple coincident releases that may influence each other from multiple release locations. In some cases, UDM may also not be appropriate to model the maximum arc-wise concentration for: (1) Dispersion over varying or sloped terrain; or (2) Dispersion between large obstructions that may cause wind-channeling. Use of the ambient conditions required under 49 C.F.R. § 193.2059 should produce conservative results (i.e., higher downwind gas concentrations and dispersion distances). UDM should be used with a safety factor of 2 (i.e., ½ LFL) to compensate for uncertainties related to potential turbulent fluctuations, source term specification, wind tunnel experiment validation results, dispersion over water, and low wind speed and high atmospheric stability validation results.

Administrator's October 7, 2011 Decision

Petitioner: GexCon US Inc.

Request: For approval (Petition) of FLACS (Version 9.1 Release 2) under 49 C.F.R. §§ 190.9 and 193.2059(a).

Response: Approved. FLACS may be used to model the maximum arc-wise concentration for: (1) Dispersion from circularly- and irregularly-shaped LNG pools; (2) Dispersion from LNG pools with low- and high-aspect ratios (ratio of the surface dimensions of the impoundment), including impoundments and trenches; (3) Dispersion from releases in any direction (horizontal, vertical, or otherwise), including releases from flashing, venting, vent stacks, and pressure relief discharge; (4) Dispersion from multiple coincident releases, including multiple release locations that may influence each other; (5) Dispersion over sloped terrain with a 10% or less grade; and (6) Dispersion over obstructions, including large obstructions that may cause wind-channeling and obstructions that may reduce the momentum and subsequent mixing of a high pressure release. In some cases, FLACS may not be appropriate to be used to model the maximum arc-wise concentration for: (1) Dispersion under unstable atmospheric (i.e., A, B, C) stability conditions; (2) Dispersion under low ambient pressure (i.e., less than 90 kPa) conditions; or (3) Dispersion over varying or sloped terrain with a 10% or greater grade.

Administrator's October 7, 2011 Decision

Petitioner: GexCon US Inc.

Request: For approval (Petition) of FLACS (Version 9.1 Release 2) under 49 C.F.R. §§ 190.9 and 193.2059(a).

(CONTINUED)

The ambient conditions required under 49 C.F.R. § 193.2059 should produce conservative results (i.e., higher downwind gas concentrations and dispersion distances). The omission of upward slopes or sloped obstructions that span short distances (e.g., berms, swells, etc.) should provide conservative results (i.e., higher downwind gas concentrations and dispersion distances). The inclusion of sloped obstructions that span short distances (e.g., berms, swells, etc.) would be more representative of the validation against obstructions and would not be limited to slopes of 10% or greater. FLACS should be used with a safety factor of 2 (i.e., ½ LFL) to compensate for uncertainties related to potential turbulent fluctuations, source term specification, wind tunnel experiment validation results, obstructed validation results, sloped validation results, and atmospheric stability validation results.

Design Spill

- Major Impact on Results
- Guillotine Cut of Large Pipe Used to Be Prevalent
- Single Accidental Leakage Source – Quite a Variation in Size – Prevalent Since 2000

Design Spill

From a recent data request sent by FERC to an operator after discussion with PHMSA (could pertain to LNG and flammable liquid refrigerants):

- FERC staff has examined typical failure rates for piping and determined the following credible single accidental leakage sources are necessary to show compliance with 49 CFR 193:
  - For piping less than or equal to 6 inches in diameter, a full pipe rupture at any point along the line; and
  - For piping greater than 6 inches in diameter, the greater of:
    - a full rupture of a connection less than or equal to 6 inches in diameter; or
    - a hole of 2 inches in diameter.

LNG Reporting Requirements

- LNG plants and facilities must report in accordance with the requirements of 49 CFR 191
  - Incidents
  - Safety-related conditions
  - Annual reports
  - OPID notifications
- By §191.7 operators must submit electronically
  - **Except** SRCR and offshore condition report
  - Written request to submit paper needed if electronic submittal poses undue burden

LNG Reporting Requirements (cont)

- §191.5 Immediate notice of certain incidents *(as defined by §191.3; by telephone)*

  (1) An event that involves a release of LNG, LPG, refrigerant gas, or gas from an LNG facility, and that results in one or more of the following consequences:

  (i) A death, or personal injury necessitating in-patient hospitalization;

  (ii) Estimated property damage of $50,000 or more, including loss to the operator and others, or both, but excluding cost of gas lost;

  (iii) Unintentional estimated gas loss of three million cubic feet or more;

  (2) An event that results in an emergency shutdown of an LNG facility. Activation of an emergency shutdown system for reasons other than an actual emergency does not constitute an incident.

  (3) An event that is significant in the judgment of the operator, even though it did not meet the criteria of paragraphs (1) or (2) of this definition.

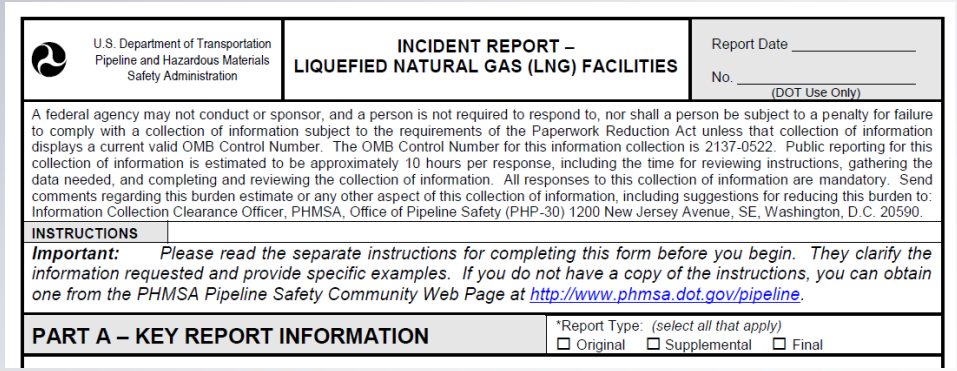
LNG Reporting Requirements (cont)

§191.15 Transmission systems; gathering systems; and **liquefied natural gas facilities**: Incident report

(b) LNG. Each operator of an LNG plant or facility must submit DOT Form PHMSA F 7100.3 as soon as practicable but not more than 30 days after detection of an incident required to be reported under §191.5 of this part.

(c) Supplemental report. Where additional related information is obtained after a report is submitted under paragraph (b) of this section, the operator must make a supplemental report as soon as practicable with a clear reference by date to the original report.

PLEASE read the instructions.



U.S. Department of Transportation
Pipeline and Hazardous Materials
Safety Administration

**INCIDENT REPORT –
LIQUEFIED NATURAL GAS (LNG) FACILITIES**

Report Date _____

No. _____
(DOT Use Only)

A federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a current valid OMB Control Number. The OMB Control Number for this information collection is 2137-0522. Public reporting for this collection of information is estimated to be approximately 10 hours per response, including the time for reviewing instructions, gathering the data needed, and completing and reviewing the collection of information. All responses to this collection of information are mandatory. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to: Information Collection Clearance Officer, PHMSA, Office of Pipeline Safety (PHP-30) 1200 New Jersey Avenue, SE, Washington, D.C. 20590.

INSTRUCTIONS

Important: *Please read the separate instructions for completing this form before you begin. They clarify the information requested and provide specific examples. If you do not have a copy of the instructions, you can obtain one from the PHMSA Pipeline Safety Community Web Page at http://www.phmsa.dot.gov/pipeline.*

PART A – KEY REPORT INFORMATION

*Report Type: *(select all that apply)*
☐ Original ☐ Supplemental ☐ Final

LNG Reporting Requirements (cont)

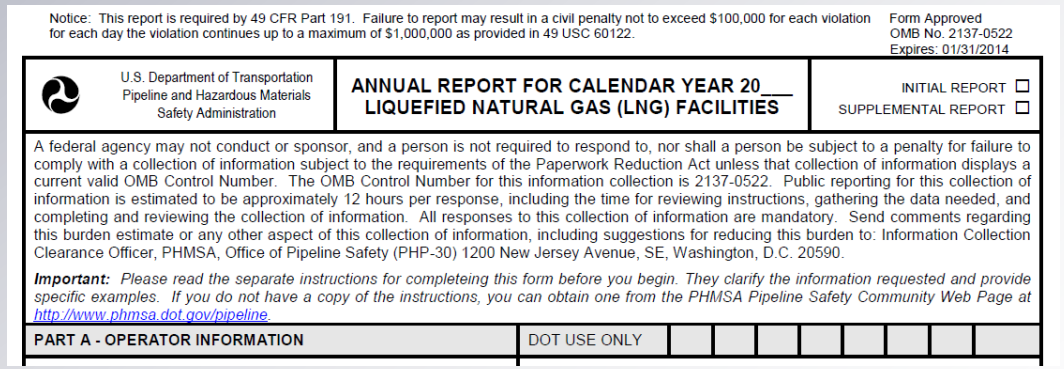
- §191.25 Filing safety-related condition reports *(as defined by §193.23)*
  - Unintended movement / abnormal loading that impairs an LNG facility
  - Any crack or defect that impairs the integrity or reliability of an LNG facility
  - Any malfunction or operating error that causes the pressure of an LNG facility to rise above its working pressure
  - A leak in an LNG facility that contains or processes gas or LNG that constitutes an emergency
  - Inner tank leakage, ineffective insulation, or frost heave that impairs the structural integrity of an LNG storage tank
  - Any safety-related condition that could lead to an imminent hazard and causes (either directly or indirectly by remedial action of the operator), for purposes other than abandonment, a 20 percent or more reduction in operating pressure or shutdown of operation of a pipeline or an LNG facility that contains or processes gas or LNG

LNG Reporting Requirements (cont)

§191.17 Transmission systems; gathering systems; and **liquefied natural gas facilities**: Annual report

(b) LNG. Each operator of a liquefied natural gas facility must submit an annual report for that system on DOT Form PHMSA 7100.3–1 This report must be submitted each year, not later than March 15, for the preceding calendar year, except that for the 2010 reporting year the report must be submitted by June 15, 2011.

PLEASE read the instructions. With the recent surge in changes of operational modes, we added several check boxes regarding the purpose of the facility in question. We also built in the possibility of reporting more than one facility/plant on one form when ownership / operatorship is common



Notice: This report is required by 49 CFR Part 191. Failure to report may result in a civil penalty not to exceed $100,000 for each violation for each day the violation continues up to a maximum of $1,000,000 as provided in 49 USC 60122.

Form Approved
OMB No. 2137-0522
Expires: 01/31/2014

U.S. Department of Transportation
Pipeline and Hazardous Materials
Safety Administration

ANNUAL REPORT FOR CALENDAR YEAR 20___
LIQUEFIED NATURAL GAS (LNG) FACILITIES

INITIAL REPORT ☐
SUPPLEMENTAL REPORT ☐

A federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with a collection of information subject to the requirements of the Paperwork Reduction Act unless that collection of information displays a current valid OMB Control Number. The OMB Control Number for this information collection is 2137-0522. Public reporting for this collection of information is estimated to be approximately 12 hours per response, including the time for reviewing instructions, gathering the data needed, and completing and reviewing the collection of information. All responses to this collection of information are mandatory. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to: Information Collection Clearance Officer, PHMSA, Office of Pipeline Safety (PHP-30) 1200 New Jersey Avenue, SE, Washington, D.C. 20590.

Important: *Please read the separate instructions for completeing this form before you begin. They clarify the information requested and provide specific examples. If you do not have a copy of the instructions, you can obtain one from the PHMSA Pipeline Safety Community Web Page at http://www.phmsa.dot.gov/pipeline.*

PART A - OPERATOR INFORMATION | DOT USE ONLY

LNG Reporting Requirements (cont)

§191.22 National Registry of Pipeline and LNG operators

(a) OPID Request. Effective January 1, 2012, each operator of an LNG facility must obtain an OPID.

(b) OPID validation. An operator who has already been assigned OPID(s) by January 1, 2011, must validate the information at *http://opsweb.phmsa.dot.gov,* and correct as necessary, no later than June 30, 2012.

(c) Changes. Each operator of an LNG facility must notify PHMSA electronically through the National Registry at *http://opsweb.phmsa.dot.gov* of certain events.

(1) An operator must notify PHMSA of any of the following events not later than 60 days before the event occurs:

(i) Construction or any planned rehabilitation, replacement, modification, upgrade, uprate, or update of a facility that costs $10 million or more. If 60 day notice is not feasible because of an emergency, an operator must notify PHMSA as soon as practicable;

LNG Reporting Requirements (cont)

§191.22 National Registry of Pipeline and LNG operators (cont)

(iii) Construction of a new LNG plant or LNG facility.

(2) An operator must notify PHMSA of any of the following events not later than 60 days after the event occurs:

(i) A change in the primary entity responsible (i.e., with an assigned OPID) for managing or administering a safety program required by this part covering pipeline facilities operated under multiple OPIDs.

(ii) A change in the name of the operator;

(iii) A change in the entity (e.g., company, municipality) responsible for an existing LNG facility;

(v) The acquisition or divestiture of an existing LNG plant or LNG facility subject to Part 193 of this subchapter.

(d) Reporting. An operator must use the OPID issued by PHMSA for all reporting requirements covered under this subchapter and for submissions to the National Pipeline Mapping System.

**** NOTE: Portions of §191.22 not relevant to LNG were omitted from these slides**

LNG Construction
Inspection Modules

1. Preliminaries – Cover Sheet, Subpart A – Reporting & Subpart B – Siting Requirements (pp. 2-6)
2. Subpart C – Design; Subpart D- Construction; NFPA 59A Emergency Shutdown (pp. 7-10)
3. Protective Enclosures, Security, Power Sources (pp. 11-12)
4. Plant Siting & Layout, Soil Protection, Process Equipment & Vaporization Facilities, General & Basic Design (pp. 13-17)
5. Seismic Design, Container Insulation, Foundations, API 620 Tanks & Field-Fabricated Containers (193.2101 (pp. 18-20)
6. High Pressure Tanks (>15 psi) (p. 21-22)
7. Concrete Tanks, Relief Devices, Piping Systems & Components, Welded Pipe Tests & Inspection (pp. 23-26)
8. Corrosion Control (NFPA 59A & 193.2304) (p. 27)
9. LNG Level Gauging, Refrigerant & Process Fluids, Pressure & Vacuum Gauges, Temperature Monitoring (p. 28)
10. Electrical Equipment, Grounding & Bonding (p. 29-30)
11. Transfer of LNG & Refrigerants (pp. 31-32)
12. Fire Protection Provisions (pp. 33-34)
13. ASME Small Containers (max 100,000 gal/tank and 280,000 gal aggregate) (pp. 35-38)
14. Construction Acceptance (193.2303); Design & Fabrication (193.2703); Construction, Installation, Inspection and Testing (193.2705); Records (193.2119); Warning Signs (193.2917) (pp. 39-40)

Questions?